SCIENTIFIC JOURNALS AND ARTICLES

THE opening (January) number of volume 15 of the *Transactions of the American Mathematical Society* contains the following papers:

T. H. Gronwall: "On the degree of convergence of Laplace's series."

L. E. Dickson: "Linear associative algebras and abelian equations."

W. B. Fite: "Some theorems concerning groups whose orders are powers of a prime."

R. E. Root: "Limits in terms of order, with examples of limiting element not approachable by a sequence."

O. E. Glenn: "The symbolical theory of finite expansions."

B. H. Camp: "Lebesgue integrals containing a parameter, with applications."

J. L. Coolidge: "Congruences and complexes of circles."

The Decmber number of the *Bulletin of the American Mathematical Society* contains: Report of the Madison Colloquium, by Arnold Dresden; Report of the Vienna meeting of the Deutsche Mathematiker-Vereinigung, by Virgil Snyder; "On binary modular groups and their invariants," by L. E. Dickson; "On some systems of collineation groups," by H. H. Mitchell; "On the sumability of Fourier's series," by T. H. Gronwall; "Note on Pierpont's Theory of Functions," by G. A. Bliss; Review of Reid's Theory of Algebraic Numbers, by E. B. Skinner; Review of the Festschrift Heinrich Martin Weber zu seinem siebzigsten Geburtstag, by R. C. Archibald; "Shorter Notices": Murray's Plane Trigonometry and Tanner and Allen's Analytic Geometry, by C. B. Hennel; Müller's Gedenktagebuch für Mathematiker and Ebner's Technische Infinitesimalrechnung, by E. W. Ponzer; Webster's Dynamics of Particles and of Rigid, Elastic and Fluid Bodies, by W. R. Longley; "Notes"; and "New Publications."

THE January number of the *Bulletin* contains: Report of the October meeting of the society, by F. N. Cole; Report of the twenty-fourth regular meeting of the San Francisco Section, by Thomas Buck; Report of the seventh regular meeting of the Southwestern Section, by O. D. Kellogg; "The infinite regions of various geometries," by Maxime Bôcher; "Shorter Notices"; Auerbach and Rothe's Taschenbuch für Mathematiker und Physiker, by G. A. Miller; Sommer-Levy's Théorie des Nombres algébriques, by E. B. Skinner; Carslaw's Infinitesimal Calculus, by A. M. Kenyon; Young's Monographs of Modern Mathematics, by R. D. Carmichael; Hawkes's Higher Algebra, by J. E. Rowe; Evans's Teaching of High School Mathematics, by E. B. Lytle; Fischer's Koordinatensysteme, by E. J. Wilczynski; "Notes"; and "New Publications."

THE February number of the *Bulletin* contains: "Some theorems on the convergence of series," by R. D. Carmichael; "A translation principle connecting the invariant theory of line congruences with that of plane n-lines," by O. E. Glenn; "Some mathematical booklet series," by R. C. Archibald; "Mathematical models," by R. C. Archibald; Review of Darboux's Systèmes orthogonaux et Coordonnées curvilignes, by E. J. Wilczynski; Review of Church and Bartlett's Descriptive Geometry, Low's Practical Geometry and Graphics, Hauck's Darstellende Geometrie, and Müller's Darstellende Geometrie für technische Hochschulen, by Virgil Snyder; "Shorter Notices"; Hensel's Zahlentheorie, by L. E. Dickson; Volterra's Equations intégrales et Equations intégro-différentielles, by Jacob Westlund; Kowalewski's Komplexe Veränderlichen und ihre Funktionen, by Arnold Dresden; Bachelier's Calcul des Probabilités, by H. L. Rietz; Einstein and Grossmann's Verallgemeinerte Relativitätstheorie, by E. B. Wilson; "Notes"; and "New Publications."

THE BOTANICAL SOCIETY OF AMERICA

II

The Anatomy of the Node as an Aid in the Classification of the Angiosperms: E. W. SINNOTT.

The node of vascular Cryptogams and Gymnosperms is recognized as a conservative region. Investigation shows that the nodal structure of Angiosperms, as well, is slow to change and is

therefore of value in classification. In the Conifers the foliar supply leaves only a single gap in the cylinder, but in the lower Angiosperms the several traces which supply every leaf come off from the stele some distance apart and each causes a gap of its own. The primitive number of foliar traces and corresponding gaps among Angiosperms seems to have been three. This is characteristic of the Amentiferæ, the simpler Ranales, the Urticales and the Rosales. It also persists in some of the higher orders, such as the Caprifoliaceæ and Compositæ. In other groups, this condition has been amplified into one with a large number of strands and gaps, as in the Magnoliaceæ, the Polygonales, the Araliales and the Monocotyledons. In still others the three gaps have become approximated and merged into one, as in the Centrospermæ, Myrtales, Ericales, Ebenales and Tubifloræ. The great simplicity of these nodal characters and their uniformity throughout such large groups of plants make them of much value in determining broad lines of relationship.

Primitive Characters Recalled by the Chestnut-bark Disease and Other Stimuli: I. W. BAILEY and J. S. AMES.

Dicotyledonous leaves with entire margins predominate in tropical regions, but are comparatively infrequent in boreal and mountainous regions. Subtropical and tropical representatives of boreal families have commonly entire leaves. Deeply lobed, dentate or serrate leaves are characteristic of Fagales endemic in northern latitudes. Toward the tropics the margins of the leaves become progressively entire. It seems probable that all living representatives, at least, of the Fagales, are descendants of boreal or mountainous forms, since vestiges of lobes, dentations and serrations persist upon young vigorous plants of subtropical species. Furthermore, the boreal type of foliage is recalled in mature parts of these plants by the stimulating effects of very rapid vigorous growth and the irritating effects produced by the attacks of insects and fungi. A striking illustration of these phenomena is afforded by the common American chestnut, *Castanea dentata* Borkh. Foliage formed subsequent to severe infections of the chestnut-bark disease (*Endothia parasitica* Murrill) is typically oak-like, frequently resembling closely *Quercus rubra* L. The reversion is not confined, however, to external characters. For the wood formed by the diseased cambium possesses anatomical structures which are a characteristic feature of the genus *Quercus*.

The Archegonium of Sphagnum subsecundum: GEORGE S. BRYAN.

Sphagnum subsecundum, where studied in the region near Chicago for the past two autumns, has been found to bear enormous numbers of sex organs. The archegonial and antheridial heads are not difficult to recognize, and may be easily distinguished from each other.

A careful study brings out the following facts, as a general statement, in regard to the development of the archegonium. Archegonia are found to occur terminally on short side branches which rise near the apex of the main stem. The apical cell of one of these branches becomes an archegonial primordium in which oblique walls appear. The cell above these walls produces the primary archegonium; while each lateral segment cut off by them forms a secondary archegonium. In the archegonium initial the first wall is transverse, and usually subsequent transverse apical divisions give rise to a filament of cells varying in number from four to six. In each cell of the filament secondary divisions occur. Finally the apical cell of the filament enlarges and oblique walls, followed by a transverse wall, cut out a cover cell and a central cell. The cover cell forms chiefly the cap of the archegonium, while the central cell on division produces a primary canal cell and a ventral cell. The primary neck canal cell gives rise to a veritable number of neck canal cells, frequently from six to eight. The ventral cell divides very late, forming the ventral canal cell and the egg. Usually just after this latter division the neck canal cells break down, but the ventral canal cell is persistent, rounding off and coming to lie in the venter near the egg, from which it may be distinguished by its slightly smaller size. Shortly before fertilization the ventral canal cell goes to pieces.

So-called abnormalities occur. Two eggs and two ventral canal cells occur occasionally, while in one case a large venter was found in which were ten such cells.

On the Structure and Relationships of Macroglossum: D. H. CAMPBELL.

Macroglossum Copeland is a genus of Marattiaceæ, founded upon a species, *M. Alidæ,* sent from Sarawak in Borneo. The writer collected it at two stations in February, 1913, and secured material of both sporophyte and gametophyte. Another species was found growing in the botanical gardens of Buitenzorg, under the name *Angiopteris Smithii* Raciborski. The origin of this lat-

ter plant is unknown, but it was probably brought from Borneo.

Macroglossum differs from *Angiopteris* in several important respects. It has simply pinnate leaves, much more like *Danæa* than *Angiopteris*. The sporangia, while distinct, are quite different from those of *Angiopteris*, and closely resemble those of *Archangiopteris* The number of sporangia in the sorus is much greater than in *Angiopteris*, sometimes exceeding 60. The indusium is also much better developed than in *Angiopteris*. There are also some important anatomical differences in the leaf structure.

Macroglossum is a large fern, the leaves being about four meters in length. In habit it resembles a gigantic *Danæa*—and also suggests strongly some of the larger species of *Zamia*. The leaflets reach a length of over 50 centimeters.

The prothallia are very large, sometimes nearly three centimeters in length by two in breadth. They are monœcious. The antheridia are very large, but otherwise much resemble those of *Angiopteris*, as do the archegonia. The embryo has a conspicuous suspensor.

Macroglossum undoubtedly belongs to the Angiopterideæ, but its affinities are rather with *Archangiopteris* than with *Angiopteris*. Like *Archangiopteris* it suggests a distant relationship to *Danæa*.

Morphology of Thismia (Bagnisia) americana n. sp.: NORMA E. PFEIFFER.

Among the Burmanniaceæ the forms closely related to *Thismia americana* have been found up to date only in the southern hemisphere, mostly in the Malay Archipelago. The particular subdivision to which this *Thismia* shows affinities has been for the most part discovered in recent years. The finding of one in a region so remote from the home of its relatives as Chicago, augurs well for the possibility of other undiscovered forms. The reduced size and anatomy of this saprophytic form are noteworthy. The floral axis arises simultaneously with a secondary root from the main root. The structure of the flower is similar to that of other *Thismias* of the *Bagnisia* section. Floral development is somewhat similar to that in the Orchidaceæ, to which resemblance in other features is evident. The characters are deemed sufficiently distinctive to warrant the establishment of a new species.

Some Observations on the Anatomy and Other Features of the Black Knot: ALBAN STEWART.

Enlargements, popularly known as "black knots," are formed on the branches of *Prunus virginiana* L. and other species of cherries, by the attack of the fungus *Plowrightia morbosa* (Schw.) Sacc. These knots may arise primarily through the infection of the branch by means of spores, or, secondarily, by the spreading of the fungus through the tissues from a knot already formed.

Normal wood of *P. virginiana* usually contains rays from one to four cells wide in cross section. As a result of the stimulating action of the fungus these rays may become much broader in infected tissue, simulating the structure of compound rays. The production of the usual elements of the xylem is greatly inhibited during the first season's growth of the knot, but there is a correspondingly great production of xylem parenchyma, which is almost absent from normal wood. By further increase in size of parenchyma cells the knot is greatly enlarged during the second season of its development. The cambium is pushed outward by this means, and with it are isolated groups of fibers and other xylem cells. There is also an abnormal growth of the ray tissue at about this time, which ruptures the cambium, opposite the rays, and pushes segments of it outward into the bark. By further division of these misplaced cambium cells, various xylem elements are produced in the bark very much out of their normal position. The segments of the cambium, which remain between the rays, retain their relative position throughout the subsequent development of the knot, and give rise to wedges of xylem each of which is subtended by a mass of phloem on the outside.

There is apparently no abnormal growth in the outer portion of the bark. It is sloughed off just before the conidia are produced.

Homologies of the Frond in Lemna: FREDERICK H. BLODGETT.

The plant body in *Lemna* has been considered by various authors as a leaf, a stem or a combination of these, but in most cases little morphological evidence is advanced for one or the other idea. The structure of the frond, especially during its early stages, is used as the basis of a discussion of the parts present. It is concluded that the frond represents a single leaf at the tip of a stem of one internode, at the tip of which a dichasial stem apex is located, and ventrally an adventitious root developed. The dichasial buds are protected by the sheath or pouch of the frond, which develops simultaneously with the buds, from the tissue immediately about the insertion of the buds upon the apical tissues, becoming congenitally

fused with the basal margin of the leaf and the lateral margin of the stem (stipe) just where this unites with the leaf.

The vertical restriction upon axial growth is found to limit the development of new parts to the horizontal plane, and successive outgrowths are produced as lateral developments rather than in a vertical succession as in normal erect stems. No new parts are found, but those present have undergone reduction as a result of adaptation to the floating habit.

Development of the Embryo and the Germination in Lemna perpusilla: Frederick H. Blodgett.

The embryo of *Lemna* develops directly from the egg cell, all of which is involved in the formation of the embryonic tissues, a true suspensor not being differentiated. The plumule becomes folded against the hypocotyl so that its tip is just under the micropyle. In this position it is enclosed by the overgrowth from the base of the cotyledon, forming a sheath or pouch. At the base of the plumule a bud is developed, which is the first true frond, and this bears the first pair of buds characteristic of the dichasial branching of the plant. The anterior half of the embryo is the cotyledon, and acts as an haustorial organ during germination, and does not function otherwise. The plumule emerges from the sheath from a horizontal slit, thus lying from the first in the plane of the water surface. The germination of the seed is in general of the type of *Pistia,* differences being due to the greater degree of reduction in the case of *Lemna,* rather than inherent variations in method.

The Chemical Dynamics of Living Protoplasm: W. J. V. Osterhout.

Van't Hoff's formulation of the laws of chemical dynamics has proved so stimulating to various fields of chemistry that it may be expected to be similarly useful if it can be applied to the activities of living protoplasm. The writer finds that by measuring the electrical resistance of living tissues it is possible to follow the progress of reactions in protoplasm in the same way that van't Hoff followed the progress of reactions *in vitro.* It therefore becomes possible to apply van't Hoff's methods and formulæ directly to protoplasm in its living and active condition. The following example will suffice to show how this may be accomplished.

The electrical resistance of living tissue of *Laminaria* was measured by a method which has been previously described. The tissue had in sea-water a resistance of 980 ohms. On being placed in NaCl .52M (which had the same conductivity as sea-water) the resistance fell after 10 minutes to 865 ohms and after 20 minutes to 745 ohms: it continued to fall rapidly and finally became stationary at 320 ohms. This represents the death-point. The total change produced by the NaCl was $930 - 320 = 660$ ohms. In order to find out whether this change had been produced in such a way as to correspond to a known type of chemical reaction the amount of change was measured at brief intervals.

According to van't Hoff we can determine from such measurements whether one, two or more substances are taking part in the reaction. If only one substance takes part (or if two substances take part but only one of them changes its concentration noticeably) the reaction is said to be of the first order (monomolecular) and it proceeds according to the formula

$$k = \frac{1}{t} \log. \frac{a}{a - x},$$

in which t is the time which has elapsed between the beginning of the reaction and the taking of the measurement, x is the loss in resistance at the time t, a is the total amount of change in resistance when the reaction is completed and k is a constant (called the velocity constant) which indicates the speed of the reaction. If the reaction is of the first order (monomolecular) k should come out constant provided the temperature be kept constant during the reaction.

In this case a, which represents the total amount of change, is $980 - 320 = 660$ ohms, while x represents the loss of resistance after 10, 20, 30 minutes, etc. The calculations show that k is nearly constant: the variations are no greater than are commonly found in measuring chemical reactions in the test-tube.

Since the effect of NaCl is within wide limits completely reversible, without production of injury, *the conception of chemical dynamics here developed applies not only to reactions which produce death, but also to reactions which involve no injury* and which form a normal part of the activity of the cell. This conclusion is fully confirmed by experiments with a variety of other substances.

A Contribution to the Theory of Antagonism: W. J. V. Osterhout.

By means of electrical measurements of living tissues it is possible to predict which salts will antagonize each other when allowed to act upon these tissues.

Differential Permeability: W. J. V. OSTERHOUT.

Various kinds of surfaces in the cell, such as the outer "plasma membrane," the vacuole-wall, the nuclear wall, the surface of the chromatophore and the cell wall can be proved to differ greatly in their behavior with respect to permeability.

The term differential permeability may be suggested as an appropriate designation of these phenomena.

The Effect of Antagonistic or Balanced Solutions Containing Sodium Chloride together with One of the Chlorides of Calcium, Magnesium, Potassium, Strontium, Ammonium or Copper, upon the Growth of Corn Plants Rooted in an Artificial Soil: JOSEPH S. CALDWELL.

The primary purpose of the work was to determine in how far the use of a solid medium having known physical properties may modify the antagonistic relationships borne by sodium to each of the other ions named.

For each of the six pairs of salts, cultures were grown in finely divided quartz to which the salt mixtures were added, the optimum water content for the quartz being maintained constantly throughout the experiment. For each pair of salts, ten to twenty different concentrations were used, the lowest of such concentration as to totally inhibit development, the last so dilute as to be entirely without effect upon the plants. For each of these concentrations, a series of cultures consisting of twelve to sixteen mixtures of the two salts in proportions ranging from 60:1 to 1:60 was made, with check cultures in each of the pure salts. The complete series for any pair of salts, therefore, shows for each salt the range of inhibitory, toxic and stimulatory effects, for comparison with the effects of isosmotic mixtures in varying proportions with the opposing salt. In all cases, results are measured by comparison of the dry weights of roots and tops, taken separately, for cultures allowed to grow under controlled conditions for 30 days.

Antagonism between sodium and strontium manifests itself at all molecular ratios between Sr 1: Na 10 and Sr 1: Na 20, and in all concentrations between those just permitting measurable development and those too dilute to have discoverable effect, but manifests itself only through its effect upon root development.

The effect of additions of calcium to sodium is merely to decrease the characteristic physiological and morphological effects of sodium in a degree directly proportional to the amount added, but in no case can these characteristic effects be made entirely to disappear. The effect of calcium is a dilution effect and not an antagonistic one.

In mixtures of copper and sodium, sodium serves merely to dilute the copper salt, decreasing the toxic or the stimulatory effect in direct proportion to the amount added, but in no case annulling the effects of the copper ion.

Additions of magnesium to sodium in any proportions or at any concentration is without effect upon the development of aerial parts. In highly toxic concentrations, mixtures in the ratio of Mg 2: Na 1 give somewhat better development of roots, while in all stimulatory concentrations the ratio 1:1 gives greatest dry weight for roots. Mixtures of sodium and potassium inhibit development of both roots and tops, in all inhibitory or toxic concentrations, to a markedly greater extent than do isosmotic solutions of the pure salts. In stimulatory concentrations, the pure salts permit greater and more normal development than do mixtures. Sodium in any proportion, even in concentrations at which it is markedly stimulatory, decreases the stimulatory effect of potassium.

For mixtures of sodium with ammonium, highly toxic concentrations permit slightly greater development when the two ions are present in the ratio 1:1. For all stimulatory concentrations, the stimulatory effect is decreased in mixtures, growth becoming better as the ratio of one ion to the other increases from 3:1 to 60:1.

Metabolic Changes in Potato Tubers During Sprouting: CHAS. O. APPLEMAN.

The following metabolic changes occurred during the early stages of sprouting: (1) Under constant storage temperature the starch was depleted, while the reducing sugars showed a slight increase. The above carbohydrate changes were more rapid in the stem end. (2) Both diastase and invertase activity of the glycerine extract quickly doubled; the increase was greater in both cases in the extract from the stem half. (3) Catalase showed a marked increase which was slightly greater in the juice from the seed end where it was more active before sprouting. (4) The nitrogen of monamino-acids and their amide derivatives increased, while the nitrogen of diamino-acids and other organic bases and the water-insoluble protein nitrogen decreased. The abundant water-soluble protein nitrogen in the tubers showed a very slight increase. (5) Organic extractive and lipoid phosphorus increase at the expense of protein and inorganic phosphorus.

The increase in lipoid phosphorus began earlier in the seed end and increased more rapidly in this end. The decrease in the inorganic phosphorus at the same stage of sprouting occurred in the seed end only. It is interesting to note that in many cases the metabolic activity was greater in the stem half, although the sprouts were all borne on the seed end.

Biochemical Study of After-ripening in the Potato Tuber: CHAS. O. APPLEMAN.

Under normal conditions potato tubers will not sprout for several weeks after harvest. During this rest period certain changes occur in the chemical or physical situation of the buds or their immediate environment, which are essential to the release of the growth processes. These changes will be spoken of as after-ripening, using the term in its broadest sense.

The tubers used in this investigation produce sprouts much earlier from the buds on the seed end. The tubers were therefore cut in half and the analyses made separately on the seed and stem halves with the view to better detect the chemical changes characteristic of after-ripening.

The carbohydrate transformations during the rest period are dependent entirely upon changing temperature. Active diastase is present at all stages of the rest period and shows no increase during natural after-ripening. Protein, lipoid, organic extractive and inorganic phosphorus, calculated to per cent. of total phosphorus, each remain constant up to the time of sprouting. After-ripening does not involve proteolysis or other changes in the various nitrogen combinations.

Metabolic changes involving the above substances and some others studied, begin rather suddenly and are concurrent with sprouting. They are, therefore, not primary processes of after-ripening.

The Physiology of the Rest Period in Potato Tubers: CHAS. O. APPLEMAN.

The rest period of the potato tuber is not firmly fixed and hereditary, as it can be entirely eliminated by means which will effect a proper adjustment between the bud tissue and external agents.

The Nutritive Value of Glycocoll to Plants from Peat Soils: A. DACHNOWSKI and R. GORMLEY.

In this preliminary statement data are submitted which were obtained from experiments in the laboratory with a variety of wheat and with several bog plants, among them *Oxycoccus, Scheuchzeria* and *Juncus.* Aside from the nutritive inequalities of amino compounds, the attempt is made to determine the limiting concentrations of organic and inorganic acids and how far fungal micorrhiza are of importance in any special absorptive powers of plants.

Twining of Plants as Related to Withdrawal of Light: F. C. NEWCOMBE.

Various plants when deprived of light lose, in the course of a few days, their power of circumnutation, and pursue a straight course, either orthotropic or plagiotropic. This loss of circumnutation is not a starvation phenomenon, but is due to a change in geotropic sensitiveness. When the plant is restored to the light, it regains, after several days, its twining ability.

Influence of Light on Infection of Certain Hosts by Powdery Mildews: GEORGE M. REED.

An attempt has been made to study the influence of various factors as water supply, temperature, mineral starvation, light, etc., upon infection of hosts by powdery mildews. The results here reported relate to the influence of light.

Seedlings of barley and wheat have been grown in the dark until the first leaf was about 2 to 3 centimeters long. The plants were then inoculated with the mildew from their respective hosts. Some of the plants inoculated were kept continuously in the dark; others were removed at once and placed in the light; at intervals of 24 hours other inoculated plants were taken from the dark and placed in the light. The general results were that no infection occurred if the plants were kept in the dark after inoculation. Upon their removal to the light, infection occurred in proportion to the degree to which the etiolated leaves turned green. In general the period of incubation was retarded proportionally to the time the plants were kept in the dark.

Another series of experiments was carried out, first growing the plants in the light and then, after inoculation, placing them in the dark, some immediately, others at intervals of 24 hours. In the case of the plants placed at once in the dark no infection occurred. Those, however, that were kept in the light for one or two days became infected. The period of the incubation of the fungus, however, was materially retarded. In general the effect of the absence of the light upon the mildew is considered to be an indirect one and has to do with the primary effect upon the development of chlorophyll in the host cell. The infection fails to occur in those cells which have not developed the chlorophyll. The mildew then is a strict parasite attacking cells which are not capable of carrying on their normal functions.

These results are quite different from those obtained by inoculating etiolated plants with saprophytic fungi. Under such conditions, in some cases at least, saprophytic fungi are able to develop on the living tissues.

Resistance of Certain Fern Prothallia to Extreme Desiccation: D. M. MOTTIER.

The prothallia of *Camptosorus rhizophyllus* and of other forms found on dry hillsides and on limestone cliffs have been subjected to conditions approximating prolonged drought in the natural environment and to conditions of extreme desiccation in the laboratory. The part the prothallia play in the ecological adaptation of these ferns is shown by their survival of the most extreme laboratory conditions and by their subsequent production of sporophytes. For example, prothallia of *Camptosorus* survive exposure to glycerine-dried air for a period of six weeks, and those of other genera even a more extended desiccation under similar and different conditions. A continuation of work published in the November number of the *Bull. Torr. Bot. Club.*

The Pyrenoid of Anthoceros: F. MCALLISTER.

All of the cells of the gametophyte of *Anthoceros lævis* contain a single large chloroplast, each of which has near its center a pyrenoid. The pyrenoid is not a homogeneous, kernel-like structure, as is the case in the algæ, but is a multiple structure made up of a dense group of from 25 to 300 disc- or spindle-shaped bodies. These bodies are protein according to the standard microchemical tests. During photosynthesis the outer bodies are transformed directly into rudimentary starch grains while new bodies seem to be formed in the interior of the mass by fission. The rudimentary starch grains increase in size as they are pushed toward the periphery of the chloroplast by younger starch grains.

In the embryonic tissue of the sporophyte the pyrenoid can not be identified, but as these cells are pushed upward scattered bodies seem to aggregate in the center of the chloroplast to form it. When fully formed it differs in no way from the pyrenoid of the gametophyte. In the sporogenous layer, however, no pyrenoids are visible and the abundant starch grains of the spore mother-cells and the spores seem to be formed much the same as in other Bryophytes.

Physical Factors in the Cleavage of Cœnocytes: R. A. HARPER.

In the Myxomycete *Didymium* we have the spores formed by progressive cleavage essentially as in *Fuligo* and the sporanges of the Mucorineæ. The presence of a capillitium of radial fibers, however, apparently makes possible the manifestation of certain factors in the process of division which are not so easily recognizable in other cases. The first visible step in cleavage seems to consist in the extrusion of water from the protoplasm. This water collects to form from one to several vacuole-like bubbles on the capillitial threads. Further contraction and extrusion of water goes on till each capillitial thread comes to be enclosed by a watery sheath. Progressive cleavage by furrows now sets in from the surface of the spore sack and from the surface of these water sheaths around the capillitial threads. Ultimately we have uninucleate spores. The whole process seems to involve active extrusion of water, and if we conceive that the chemical constitution of the nuclei is such as to favor the retention of moisture in the cytoplasm immediately adjacent to them we should have a condition which would tend toward the orientation of the cleavage furrows in such a position as to lead ultimately to the production of uninucleated spore masses.

The Harmful Action of Distilled Water: R. H. TRUE.

It appears probable that the problem of injury by distilled water is not a simple one capable in all cases of a like explanation. In some cases, distilled water obtained from apparatus having copper surfaces exposed to contact with the water undoubtedly derives certain toxic properties from minute traces of copper. In other cases, doubtless, it is possible for other harmful impurities to find their way into the product, but after the action of all the impurities has been accounted for there still remains a residuum of harmful action due to no known type of impurity. This mode of harmful action seems to be most marked in water which shows the highest resistance to the passage of the electric current.

Samples of distilled water which show the highest resistance are in general more harmful to lupine roots than waters containing a large quantity of electrolytes. These same samples of water withdraw electrolytes from the tissues of the roots when they remain in the water. This leaching of electrolytes is shown to be the probable mechanism by means of which purer samples of distilled water exert their harmful action on the roots. This action has a physical osmotic component, but for the roots of *Lupinus albus,* this osmotic factor seems to be decidedly secondary

in importance, the primary cause of injury being the extraction of electrolytes and perhaps of other substances as well. This extraction by distilled water is regarded as but a special case of the general type of injury wrought on cells by unbalanced solutions whereby certain necessary constituents, undoubtedly in part inorganic, are dissociated from their proper attachments in the complicated chemical and physical mechanism of the living cell. The distilled water seems to withdraw material required for the maintenance of the efficient action of the protoplasmic limiting membranes, with the result that the permeability of the cells is increased, and a further dissociation of electrolytes from their points of combination in the proteids, and other chemical structures of the cell, ensues. These dissociated electrolytes escape from the cell and increase the conductivity of the distilled water. When a trace of calcium ions is present in the distilled water, this dissociating power of the distilled water over the proteids and other chemical mechanisms of the cells is largely developed, and the chemical integrity of the cells is protected in some way not known.

This report is preliminary in its nature and is to be followed at a future date by a further contribution reporting the results of work now under way.

Distilled Water in the Laboratory: R. H. TRUE.

With the discovery made by Nägeli and Loew that copper distilling apparatus may yield water containing traces of copper sufficient to render the water harmful for plant cultures, the use of glass distilling apparatus became general, and carefully distilled water obtained from glass came to receive the general confidence of biologists. While in the majority of cases this confidence is well placed, errors in the interpretation of results are likely to follow a failure to recognize and allow for certain chemical and physiological characteristics of so-called pure water. Aside from the difficulty of obtaining pure water, this substance having been prepared in a pure state but a few times and then by chemists and physicists, there is the further difficulty of maintaining it in a pure state, since it readily becomes charged with gaseous products of the air, and when exposed to the air of the laboratory is especially likely to assume harmful properties for plant cultures—a danger which may be minimized through taking precaution to exclude these impurities from contact with the water. Another source of almost unavoidable contamination is seen in the solubility of the usual glass containers, which, unless specially prepared for the purpose, give up to the water sufficient solids to steadily increase the electrical conductivity.

Since a minimum of impurities will be found even in the purest water obtainable for practical experimental purposes, the action of the dilute solution which goes under the name of distilled water comes up for consideration. It has been shown that "distilled water" is injurious to the roots of certain plants, and that this action is paralleled by, and probably due, in great measure, to, the leaching of constituents necessary to the maintenance of life activities.

When check cultures grown in distilled water are used as a standard of comparison and regarded as normal, great danger of serious error in interpreting the results of biological experiments arises, since the behavior of check cultures in distilled water can not safely be regarded as an expression of normal activity.

It appears that plant physiologists need in their work a normal physiological solution, this normal solution to be such a medium as will cause the least possible disturbance to the usual activities of the plant. While the difficulties introduced by the use of a normal physiological solution are many, and will necessitate great care not only in meeting different requirements of various types of plants, but also with respect to the purity of chemicals used, the insolubility of glassware, the quality of distilled water employed, etc., there seems to be little doubt that such physiologically approximate mixtures are likely to give results much more closely approaching physiological soundness than is possible with the use of distilled water.

GEORGE T. MOORE
Secretary

JOINT ANNUAL MEETING OF AMERICAN ANTHROPOLOGICAL ASSOCIATION AND AMERICAN FOLK-LORE SOCIETY

THE annual meeting of the American Anthropological Association was held in West Assembly Hall, American Museum of Natural History, New York City, December 29–31, 1913, in affiliation with the American Folk-Lore Society. The joint program was unusually long and more cosmopolitan than at any previous meeting, and the sessions were well attended. The thanks of the members of both societies are due to the American Museum